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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

ARMSTRONG, ANGELA A

ART UNIT PAPER NUMBER

2654

DATE MAILED: 12/31/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/380,563

Applicant(s)

SHOZAKAI ET AL.

Examiner

Angela A. Armstrong

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 October 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-12 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-12 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 1 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Furukawa et al (US Patent No. 5,463,618) in view of applicant's admitted prior art.

Regarding claims 1 and 7, Furukawa et al discloses an echo canceller with Normalized Least Mean Square algorithm and teaches

Determining a pseudo acoustic signal at col. 6, lines 14-21 which reads on "generating a pseudo acoustic echo signal"

Providing for holding signals at col. 6, lines 18-19, which reads on "holding the current impulse response and supplying the current impulse response"

Subtraction of the pseudo acoustic echo signal at col. 6, lines 21-26, which reads on "an elimination step for subtracting said pseudo acoustic echo signal from a microphone input"

Sampling the input signal at 8 kHz at col. 5, lines 56-57, which reads on "an update step"

Furukawa does not specifically disclose using time domain and frequency domain information of the acoustic echo-canceled signal for checking whether or not voice is included in the microphone input signal, wherein the microphone input signal comprises background noise. However, checking, in each frame, whether or not voice is included in an input signal, by using time domain and frequency domain information of an acoustic echo-canceled signal, wherein the

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microphone input signal comprises background noise is known in the art, as indicated by applicant's admitted prior art at page 20, lines 16-24 of the specification.

Therefore, it would have been obvious to one of ordinary skill at the time of the invention to modify the system of Furukawa et al, to implement checking, in each frame, whether or not voice is included in an input signal, by using time domain and frequency domain information, for the purpose of improving signal quality in a noisy environment.

Additionally, Furukawa teaches suspending or continuing adaptation so as to control or renew filter coefficients of the adaptive filter, which reads on "...storing in said storage step the current impulse response...retrieving one of the stored impulse responses stored..."

2. Claims 2 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Furukawa et al in view of applicant's admitted prior art, as applied to claims 1 and 7 above, and further in view of Schalk (US Patent No. 5,475,791).

Regarding claims 2 and 8, Furukawa et al and applicant's admitted prior art teach everything as claimed in claims 1 and 7. Neither Furukawa et al nor applicant's admitted prior art specifically teach that the echo-cancelled signal is used for speech recognition.

In a similar field of endeavor, Schalk teaches a method for recognizing a spoken word in the presence of interfering speech in a voice processing system for use in conjunction with telephone networks, which uses an echo canceled signal to perform the speech recognition (Abstract), for the purpose of providing an enhanced technique for use in a voice processing application wherein a caller's speech occurring during outgoing voice messaging can be recognized and used by the voice processing system.

Therefore, it would have been obvious to one of ordinary skill at the time of the invention to modify the system of Furukawa et al and applicant's admitted prior art for implementation of an echo canceled signal in a speech recognition system, as taught by Schalk, for the purpose of providing an enhanced technique for use in a voice processing application wherein a mobile caller's speech occurring during outgoing voice messaging can be recognized and used by the voice processing system.

3. Claims 3 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Furukawa et al, applicant's admitted prior art, and Schalk, as applied to claims 2 and 8 above, and further in view of Flores et al, ("Continuous Speech Recognition in Noise Using Spectral Subtraction and HMM Adaptation", 1994).

Regarding claims 3 and 9, Furukawa et al, applicant's admitted prior art and Schalk teach everything as claimed in claims 2 and 8. Neither Furukawa et al, applicant's admitted prior, nor Schalk specifically teach determining a spectrum mean and subtracting the spectrum mean from the spectrum.

Flores et al teach a scheme for robust speech recognition in which a continuous spectral subtraction (CSS) scheme is implemented to enhance a received speech signal. The CSS scheme receives noisy speech, performs a Fourier transform, determines a spectrum average and subtracts the spectrum average from the spectrum (page 409, Figure 1).

Therefore, it would have been obvious to one of ordinary skill at the time of the invention to modify the system of Furukawa et al, applicant's admitted prior art, and Schalk to implement a continuous spectral subtraction scheme for a speech recognition system, as taught by Flores et al,

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for the purpose of providing signal enhancement of the received signal to be used in the speech recognizer.

4. Claims 4-5 and 10-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Furukawa et al, applicant's admitted prior art, and Schalk, as applied to claims 2 and 8 above, and further in view of Rahim et al ("Signal Conditioning Techniques for Robust Speech Recognition", 1996), Flores et al, ("Continuous Speech Recognition in Noise Using Spectral Subtraction and HMM Adaptation", 1994) and well known prior art.

Regarding claims 4-5 and 10-11, Furukawa et al, applicant's admitted prior, nor Schalk specifically teach determining a spectrum mean and subtracting the spectrum mean from the spectrum.

Flores et al teach a scheme for robust speech recognition in which a continuous spectral subtraction (CSS) scheme is implemented to enhance a received speech signal. The CSS scheme receives noisy speech, performs a Fourier transform, determines a spectrum average and subtracts the spectrum average from the spectrum (page 409, Figure 1).

Therefore, it would have been obvious to one of ordinary skill at the time of the invention to modify the system of Furukawa et al, applicant's admitted prior art, and Schalk to implement a continuous spectral subtraction scheme for a speech recognition system, as taught by Flores et al, for the purpose of providing signal enhancement of the received signal to be used in the speech recognizer.

Furukawa do not teach cepstral mean subtraction. Refer to Rahim et al, who teach a speech recognition system with signal enhancement which implements a cepstral mean subtraction algorithm via determining the cepstrum, calculating the average cepstrum and

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subtracting the average cepstrum from the cepstrum. Rahim et al teach that cepstral mean subtraction is widely used in speech recognition (page 107, col. 1, section II) and that it improves the robustness in speech recognition by minimizing distortion on the input signal to the recognizer (page 107, col. 1, section I).

Therefore, it would have been obvious to one of ordinary skill at the time of invention to modify the system of Furukawa et al, and implement a cepstral mean subtraction algorithm as taught by Rahim et al, for the purpose of improving the robustness in the speech recognizer, as suggested by Rahim et al.

Rahim et al do not specifically teach that the cepstrum is obtained by performing a Fourier transform on the spectrum. However, it is well known in the art of speech signal processing to perform a Fourier transform on the logarithm of a spectrum to obtain a cepstrum.

Therefore, it would have been obvious to one of ordinary skill at the time of the invention to modify the system of Rahim et al to perform a Fourier transform on a spectrum in order to obtain the cepstrum, as is well known in the art, for the purpose of efficiently canceling multiplicative distortions.

Rahim et al do not specifically teach implementing cepstral mean subtraction (CMS) on a non-speech cepstrum. However, it is well know in the art to provide for estimates of non speech (or noises) in the implementation of a subtraction scheme for noise suppression.

Therefore, it would have been obvious to one of ordinary skill at the time of invention to use a CMS algorithm on a speech cepstrum and a non-speech cepstrum to provide an accurate estimate of other sounds or noise, so as to provide more efficient signal enhancement of the input signal to the speech recognizer.

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5. Claims 6 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rahim et al, ("Signal Conditioning Techniques for Robust Speech Recognition", 1996) and well known prior art.

Regarding claims 6 and 12, Rahim et al teach determining the cepstrum, calculating the average cepstrum and subtracting the average cepstrum from the cepstrum. Rahim et al do not specifically teach that the cepstrum is obtained by performing a Fourier transform on the spectrum. However, it is well known in the art of speech signal processing to perform a Fourier transform on the logarithm of a spectrum to obtain a cepstrum.

Therefore, it would have been obvious to one of ordinary skill at the time of the invention to modify the system of Rahim et al to perform a Fourier transform on a spectrum in order to obtain the cepstrum, as is well known in the art, for the purpose of efficiently canceling multiplicative distortions.

Rahim et al do not specifically teach implementing cepstral mean subtraction (CMS) on a non-speech cepstrum. However, it is well know in the art to provide for estimates of non speech (or noises) in the implementation of a subtraction scheme for noise suppression.

Therefore, it would have been obvious to one of ordinary skill at the time of invention to use a CMS algorithm on a speech cepstrum and a non-speech cepstrum to provide an accurate estimate of other sounds or noise, so as to provide more efficient signal enhancement of the input signal to the speech recognizer.

Response to Arguments

6. Applicant's arguments filed October 15, 2002, regarding claims 1-3, 6-9, and 12 have been fully considered but they are not persuasive.

Regarding claims 1 and 7, applicant argues the cited references do not disclose the structure recited in the claims. The Examiner disagrees and argues Furukawa at col. 5, line 64 continuing to col. 6, line 12 describes the functionality of the echo canceller with implementation of first and second adaptive filters which update the filter coefficients by NLMS and a voice detector, which reads on "control means..." and "control step...". At col. 6, lines 14-21, Furukawa describes the operations of the adaptive filters, which holds the estimated impulse response and supplies the response when updating the filter coefficient, which reads on "storage means/step" and "holding means/step". Furukawa also provides a voice detector (col. 6, lines 8-10), which reads on "decision means/step."

In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, one of ordinary skill would combine the teachings of the prior art for the purpose of improving the signal quality in a noisy environment.

Applicant also argues that Furukawa and applicant's admitted prior art teach away from the attempted combination because Furukawa samples the signals at 8 kHz. The examiner

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disagrees and argues that Furukawa implements a well known speech processing feature of sampling speech at a desired sampling rate for use in speech processing. Further, the teachings of applicant's admitted prior art specifically provides for checking in each frame whether or not voice is included in a microphone signal by using time domain and frequency domain information, and one of ordinary skill in the art would be have the knowledge to be successfully modify the system of Furukawa to implement using both time domain and frequency domain information, so as to achieve desirable results.

Regarding claims 3 and 9, applicant argues the cited references do not disclose each and every element of the claims, because the cited references do not disclose "means for determining a spectrum for each frame by performing a Fourier transform on an acoustic echo-canceled signal." The Examiner disagrees and argues, Furukawa, applicant's admitted prior art, and Schalk teach everything as claimed in claims 2 and 8, including providing frames of "an acoustic echo-cancelled signal." Flores is cited for teaching "means for determining a spectrum" and "performing a Fourier transform". Thus, the combination of the cited references would teach or suggest, providing frames of "an acoustic echo-cancelled signal", as provided by Furukawa, applicant's admitted prior art, and Schalk such that a spectrum is determined for each frame by performing a Fourier transform, as provided by Flores.

In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5

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USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Flores specifically indicates improvements are obtained by adding the explicit signal enhancement (spectral subtraction), at page 411, col. 2, section 5.

In response to applicant's request for reference citation to support that "it is well known in the art to provide for estimates of non speech (or noise) in the implementation of a subtraction scheme for noise suppression", applicant is referred to Eatwell (US Patent No. 5,742,694), Raman (US Patent No. 6,001,131), and Arslan et al (US Patent No. 6,263,307).

Applicant's arguments with respect to claims 4-5 and 10-11 have been considered but are moot in view of the new ground(s) of rejection.

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Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Angela A. Armstrong whose telephone number is 703-308-6258.

The examiner can normally be reached on Monday-Thursday 7:30-5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Marsha Banks-Harold can be reached on (703) 305-4379. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9314 for regular communications and 703-872-9314 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-306-0377.

AAA
December 30, 2002

Marsha D Banks-Harold
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